

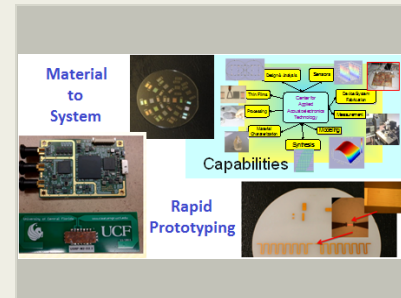
# Passive Wireless Sensor System for Space and Structural Health Monitoring, Phase I

Completed Technology Project (2016 - 2017)



## Project Introduction

Aviana Molecular (Aviana) and the University of Central Florida (UCF) propose to develop a Passive Wireless Sensor System (PWSS) for Structural Health Monitoring (SHM). SAW sensors are lightweight, passive (battery-less), simple, reliable, scalable, sensitive, do not disturb the operating environment, can be permanently placed on the critical components, allow quick and inexpensive acquisition of data to diagnose structure performance or failures, and transmit the relevant data to a remote data processing center wirelessly. Phase I of this proposal will study approaches for SAW sensor embodiments that can be embedded in composites (antenna design for embedding or on the surface of composite materials) and the use of clustered sensors for enhanced redundancy, accuracy, and range. The target sensor measurands will be temperature, range data, and gas detection. Phase I will study tradeoffs in center frequency, bandwidth, device embodiments, and transceiver approaches for launch, space vehicle and exploration. The Phase I study and prototyping will enhance the current UCF SAW sensor transceiver capabilities by making an advanced transceiver that will be less than 1 Kg in weight, be less than .05 m3 in volume, and use less than 5 W of power. Studies and experiments will be performed to achieve single acquisition times of approximately 1 ms, or less, and multiple coherent interrogation integrations at a rate of 10 ms, or less, for enhanced signal to noise ratio. It is anticipated that ranges of 50-100 feet will be demonstrated and multiple coherent integrations will be studied for desired ranges of 0.5 to 1 Km. At the end of Phase I, recommendations for a path forward in Phase II for an advanced wireless passive SAW sensor system will be proposed. In addition, it is envisioned that hardware demonstrations of a Phase I effort prototype system will be shown as part of the final report/presentation.



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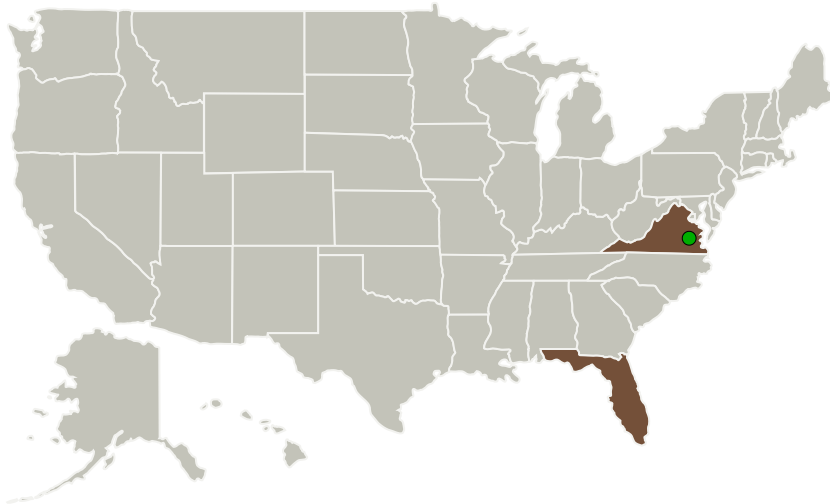
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## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Aviana Molecular Technologies, LLC	Lead Organization	Industry	Orlando, Florida
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia
University of Central Florida(UCF)	Supporting Organization	Academia	Orlando, Florida

### Primary U.S. Work Locations

Florida	Virginia
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## Project Transitions

**June 2016:** Project Start

**June 2017:** Closed out

### Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140108>)

## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Organization:

Aviana Molecular Technologies, LLC

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

### Program Director:

Jason L Kessler

### Program Manager:

Carlos Torrez

### Principal Investigator:

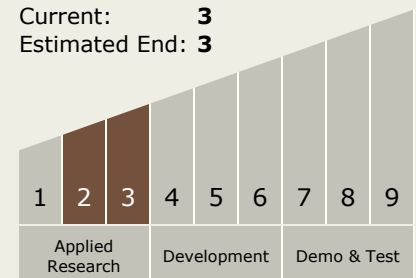
Arthur Weeks

## Technology Maturity (TRL)

Start: **2**

Current: **3**

Estimated End: **3**

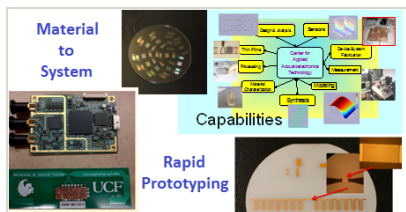


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## Images



### Briefing Chart Image

Passive Wireless Sensor System for Space and Structural Health Monitoring, Phase I  
(<https://techport.nasa.gov/image/133949>)



### Final Summary Chart Image

Passive Wireless Sensor System for Space and Structural Health Monitoring, Phase I Project Image  
(<https://techport.nasa.gov/image/134502>)

## Technology Areas

### Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - └ TX12.2 Structures
    - └ TX12.2.3 Reliability and Sustainment

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System